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Amendments to the Claims

Please amend Claims 69, 71, 72 and 75, and add new Claim 88. Please cancel Claim 74. The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing

1. (Previously presented) A method of phase-shifting a beam from an electromagnetic beam source in a lithographic process comprising:
 - focusing a beam from the electromagnetic beam source onto a mask, the mask adapted to selectively phase-shift at least a portion of the beam according to a predetermined pattern;
 - passing the beam from the electromagnetic beam source through the mask producing a phase-shifted beam; and
 - directing the phase-shifted beam at a substrate adapted to be selectively etched according to the predetermined pattern.
2. (Original) The method of claim 1 wherein the phase-shifted beam comprises a plurality of beam portions.
3. (Original) The method of claim 2 wherein the beam portions include at least a first beam portion and a second beam portion.
4. (Original) The method of claim 3 wherein the first beam portion corresponds to at least one primary feature and the second beam portion corresponds to at least one assist feature.
5. (Original) The method of claim 3 wherein the first beam portion and the second beam portion are at unequal phases.
6. (Original) The method of claim 5 wherein the first beam portion is substantially a multiple of 180 degrees out of phase from the second beam portion.

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7. (Original) The method of claim 1 wherein the phase-shift is a strong phase-shift.
8. Cancelled.
9. Cancelled.
10. (Original) The method of claim 4 wherein the primary feature is an isolated feature on the mask.
11. (Original) The method of claim 4 further comprising forming the assist feature by a subtractive etch process.
12. (Original) The method of claim 4 further comprising forming the primary feature by a subtractive etch process.
13. (Original) The method of claim 1 further comprising forming the mask from a photomask material having a transmittance greater than zero and less than or equal to one.
14. (Original) The method of claim 4 further comprising forming the assist feature by an additive process.
15. (Original) The method of claim 4 further comprising forming the primary feature by an additive process.
16. (Original) The method of claim 1 wherein the electromagnetic beam source is an actinic light source.
17. (Original) The method of claim 1 further comprising the steps of:
employing an EMF (electromagnetic field) simulator; and
determining a complex transmittance and phase.

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18. (Original) The method of claim 4 wherein the at least one assist feature comprises multiple pairs of assist features.
19. (Original) The method of claim 4 wherein the at least one primary feature comprises two dimensional primary features.

Claims 20-37 Cancelled.

Claims 38-68 Cancelled.

69. (Currently amended) A method of forming a phase-shift mask employing photomask topography and photoresist sensitivity to electromagnetic radiation comprising:
 - determining a proposed pattern layout for a phase-shift mask comprising a primary feature and one or more assist features;
 - analyzing, in a frequency domain, the phase and amplitude of a diffraction pattern of the proposed mask pattern via a Fourier transform; and
 - based upon the analysis step, adjusting a physical characteristic of the primary feature or an assist feature, and repeating the analyzing and adjusting steps until a final mask pattern is determined in which opposing electric fields generated at the primary feature and at the one or more assist features balance to produce a desired amount of zero-order light for a selected imaging application substantially eliminate the electric field at the zero frequency of the primary feature, thereby improving tolerance to imaging system focal variation during a final image formation.
70. (Previously presented) The method of claim 69, further comprising fabricating a mask in accordance with the final mask pattern layout.
71. (Currently amended) The method of claim 69 A method of forming a phase-shift mask employing photomask topography and photoresist sensitivity to electromagnetic radiation comprising:
 - determining a proposed pattern layout for a phase-shift mask comprising a primary feature and one or more assist features;

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analyzing, in a frequency domain, the phase and amplitude of a diffraction pattern of the proposed mask pattern via a Fourier transform; and

based upon the analysis step, adjusting a physical characteristic of the primary feature or an assist feature, and repeating the analyzing and adjusting steps until a final mask pattern is determined in which opposing electric fields generated at the primary feature and at the one or more assist features balance to produce a desired amount of zero-order light for a selected imaging application, wherein the phase-shift mask comprises a strong phase-shift mask.

72. (Currently amended) ~~The method of claim 69~~ A method of forming a phase-shift mask employing photomask topography and photoresist sensitivity to electromagnetic radiation comprising:

determining a proposed pattern layout for a phase-shift mask comprising a primary feature and one or more assist features;

analyzing, in a frequency domain, the phase and amplitude of a diffraction pattern of the proposed mask pattern via a Fourier transform; and

based upon the analysis step, adjusting a physical characteristic of the primary feature or an assist feature, and repeating the analyzing and adjusting steps until a final mask pattern is determined in which opposing electric fields generated at the primary feature and at the one or more assist features balance to produce a desired amount of zero-order light for a selected imaging application, wherein the mask pattern is designed to substantially eliminate zero-order light when an electromagnetic beam passes through the primary feature and the one or more assist features.

73. (Previously presented) The method of claim 69, wherein the desired imaging application comprises imaging an isolated feature.

74. Cancelled.

75. (Previously presented) ~~The method of claim 69, A method of forming a phase-shift mask employing photomask topography and photoresist sensitivity to electromagnetic radiation comprising:~~

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determining a proposed pattern layout for a phase-shift mask comprising a primary feature and one or more assist features;

analyzing, in a frequency domain, the phase and amplitude of a diffraction pattern of the proposed mask pattern via a Fourier transform; and

based upon the analysis step, adjusting a physical characteristic of the primary feature or an assist feature, and repeating the analyzing and adjusting steps until a final mask pattern is determined in which opposing electric fields generated at the primary feature and at the one or more assist features balance to produce a desired amount of zero-order light for a selected imaging application, wherein the desired imaging application comprises an off-axis illumination.

76. (Previously presented) The method of claim 69, wherein the analyzing step comprises simulating the performance of the proposed mask layout on a computer.
77. (Previously presented) The method of claim 76 wherein the computer further comprises a plurality of computers in parallel.
78. (Previously presented) The method of claim 69, wherein adjusting a physical characteristic of the primary feature or an assist feature comprises adjusting at least one of the size, location, thickness, or transmittance of the feature.
79. (Previously presented) The method of claim 69 further comprising forming an assist feature by a subtractive etch process.
80. (Previously presented) The method of claim 69 further comprising forming the primary feature by a subtractive etch process.
81. (Previously presented) The method of claim 69 further comprising forming an assist feature by an additive process.
82. (Previously presented) The method of claim 69 further comprising forming the primary feature by an additive process.

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83. (Previously presented) The method of claim 69 further comprising forming the mask from a photomask material having a transmittance greater than zero and less than or equal to one.
84. (Previously presented) The method of claim 69 further comprising forming an assist feature from a material having a transmittance greater than zero and less than or equal to one.
85. (Previously presented) The method of claim 69 wherein the analyzing step comprises:
employing an EMF (electromagnetic field) simulator; and
determining a complex transmittance and phase of the primary and assist features,
and using this information to construct a diffraction pattern for analysis.
86. (Previously presented) The method of claim 69 wherein the one or more assist features comprises multiple pairs of assist features.
87. (Previously presented) The method of claim 69 wherein the primary feature comprises a two dimensional primary feature.
88. (New) The method of claim 75, wherein the method is used with off-axis illumination to substantially eliminate asymmetric sources of interference from diffraction beams of higher order (greater than zero) and/or zero order, thereby improving tolerance to imaging system focal variation during a final image formation.